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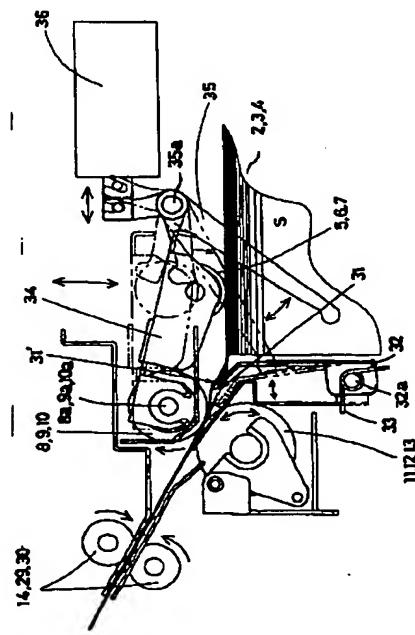
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(54) 【発明の名称】 シート給送装置及び画像形成装置

(57) 【要約】

【課題】 本発明は、シート載置手段から複数枚のシートが束となって給送された場合にリタード分離手段の手前でシート束を捌いて分離しながらも分離回転体による束搬送されたシートの戻し搬送を妨げない分離部材を設けることで多様化するシートに対しても重送等の給送不良を防止することが出来るシート給送装置及びこれを持った画像形成装置を提供することを可能にすることを目的としている。

【解決手段】 プレ分離板32が回動軸32aを中心に回動可能に設けられ、ねじりコイルバネ33により常時搬送経路31上に突出する位置に付勢されている。ソレノイド36により駆動されてピックアップローラ支持部材34を揺動させるリンク35によりピックアップローラ5、6、7をシートSから離間すると同時にプレ分離板32を押し倒して搬送経路31から退避させるように構成したことを特徴とする。



特開2000-191169  
(P2000-191169A)

(2)

2

## 【特許請求の範囲】

【請求項1】 シートを載置するシート載置手段と、前記シート載置手段に載置されたシートを給送するシート給送手段と、前記シート給送手段よりもシート給送方向下流側に配置され、該シート給送手段により給送されたシートを搬送する搬送回転体と、前記搬送回転体に対向して配置され、該搬送回転体との協働作用によりシートを分離する分離回転体と、前記シート載置手段よりもシート給送方向下流側で、且つ前記搬送回転体と前記分離回転体とのニップ部よりもシート給送方向上流側に配置され、前記シート給送手段により給送されるシートの搬送経路上に突出し、該シートに当接してシートを分離する分離部材と、前記分離部材を前記シート給送手段により給送されるシートの搬送経路上に突出させる突出位置と、該搬送経路上から退避する退避位置とに移動させる移動手段と、を有することを特徴とするシート給送装置。

【請求項2】 前記分離部材をシートの搬送状態に応じて前記シート給送手段により給送されるシートの搬送経路上に突出させる突出位置と、該搬送経路上から退避する退避位置とに移動させることを特徴とする請求項1に記載のシート給送装置。

【請求項3】 前記シート給送手段は第1の揺動手段により前記シート載置手段に載置されたシートに当接／離間され、前記分離部材は第2の揺動手段により前記シート給送手段により給送されるシートの搬送経路上に突出／退避され、前記シート給送手段のシートからの離間動作に連動して前記分離部材をシートの搬送経路上から退避させることを特徴とする請求項1または請求項2に記載のシート給送装置。

【請求項4】 前記分離回転体が前記搬送回転体に対して逆転する時、前記分離部材をシートの搬送経路上から退避させ、前記分離回転体が前記搬送回転体に対して従動する時、前記分離部材をシートの搬送経路上に突出させることを特徴とする請求項1または請求項2に記載のシート給送装置。

【請求項5】 前記分離部材は揺動手段により前記シート給送手段により給送されるシートの搬送経路上に突出／退避され、前記分離回転体が前記搬送回転体に対して逆転する時、前記分離回転体の回転に連動するカムが前記分離部材をシートの搬送経路上から退避させることを特徴とする請求項4に記載のシート給送装置。

【請求項6】 請求項1～5のいずれか1項に記載のシート給送装置を備え、画像情報に応じてシートに画像を形成する画像形成手段を有することを特徴とする画像形成装置。

## 【発明の詳細な説明】

【0001】

【発明の属する技術分野】 本発明は、複写機やプリン

タ、ファクシミリ等の画像形成装置に装備されるシート給送装置に関するものである。

【0002】

【従来の技術】 従来のシート給送装置の一例を図5～図7を用いて説明する。図5において、シート給送装置101は図示しないシート載置台上に複数枚のシートSが積み重ねられて収納されたシート収納装置102から最上位のシートSを1枚ずつ給送するピックアップローラ103と、該ピックアップローラ103によりシート収納装置102から給送されたシートSを画像形成装置本体内(図5の矢印a方向)へ搬送するフィードローラ104と、該フィードローラ104に対向して配置されたリタードローラ105と画像形成装置本体の手前側に配置された搬送ローラ対106とを有している。

【0003】 ピックアップローラ103により給送されたシートSが複数枚の場合にはリタードローラ105はフィードローラ104の回転方向と逆方向(図5の矢印b方向)に回転して下位のシートSを戻し搬送し、最上位の1枚だけが分離給送される。

【0004】 また、ピックアップローラ103とフィードローラ104及びリタードローラ105との間のシート通過領域107には上ガイド108が配置され、フィードローラ104及びリタードローラ105と搬送ローラ対106との間、及び搬送ローラ対106と画像形成装置本体との間に下ガイド109が配置されている。そして、上ガイド108と下ガイド109とによりシートSがガイドされて給送される。

【0005】 フィードローラ104及びリタードローラ105は図6に示す駆動伝達装置110によって駆動される。駆動伝達装置110にはフィードローラ104が軸支されるフィードローラ軸104aと、リタードローラ105が軸支されるリタードローラ軸105a及び該リタードローラ軸105aに連結されたリタードローラ駆動軸105bが略平行に配置されている。

【0006】 リタードローラ軸105aは図5に示すように回動軸111aを中心に揺動可能な支持部材111に支持されてフィードローラ軸104aに対して平行に接離可能となっている。また、リタードローラ軸105aとリタードローラ駆動軸105bとの間にはカップリング112及びトルクリミッタ113が設けられている。

【0007】 フィードローラ軸104aの端部には図示しない画像形成装置本体のメイン駆動手段から駆動入力ベルト114を介して伝達された駆動力をフィードローラ軸104aに伝達する電磁クラッチ115が設けられている。

【0008】 また、フィードローラ軸104aとリタードローラ駆動軸105bとの間にはフィードローラ軸104aに伝達された回転駆動力をリタードローラ駆動軸105bに伝達するリタード駆動ベルト116が巻き掛けられている。尚、カップリング112はリタードローラ105が変位しても駆動をリタードローラ駆動軸105bからリタードローラ軸10

特開2000-191169  
(P2000-191169A)

(3)

3

5aに伝達するためのものである。

【0009】上記駆動伝達装置110によるフィードローラ104及びリタードローラ105の駆動について説明すると、先ず、図示しない画像形成装置本体のメイン駆動手段から与えられた回転駆動力は駆動入力ベルト114に伝達され、シートSの給送タイミングに応じてON/OFF F制御される電磁クラッチ115のアマチュア部に設けられたブーリ115aに入力される。

【0010】ここで、電磁クラッチ115のロータ部と一体的に回転するフィードローラ軸104aとリタードローラ軸105b及びリタードローラ軸105aはリタード駆動ベルト116によって連結されているのでフィードローラ軸104aとリタードローラ軸105a及びリタードローラ駆動軸105bは同方向に回転し、フィードローラ104とリタードローラ105はシートSの給送タイミングON時に同期して回転駆動される。

【0011】上記駆動伝達装置110によりシートSが給送方向(図5及び図6の矢印a方向)に1枚ずつ送られる際、リタードローラ105はフィードローラ104及びシートSとの間の摩擦力によりトルクリミッタ113が空転してリタードローラ駆動軸105bの駆動回転方向と逆方向に回転する。

【0012】また、複数枚のシートSが給送された際にはリタードローラ105とシートSとの間の摩擦力に対して複数枚のシートS間の摩擦力が小さいことからトルクリミッタ113は空転せずにリタードローラ105はリタードローラ駆動軸105bの回転駆動方向と同方向に回転する。

【0013】これにより、複数枚送られたシートSの中のフィードローラ104側、即ち、最上位のシートSとそれよりも下位のシートSとを分離し、画像形成装置本体内へのシートSの重送を防止するようになっている。

【0014】次に上記構成のシート給送装置101によるシートSの分離給送条件を満足する原理について説明する。以下の①式は給送条件、②式は分離条件、③はリタードローラ105の連れ回り条件を夫々満足する関係式を示す。

【0015】尚、以下の①、②、③式において、 $\mu_{AP}$ はピックアップローラ103とシートS間の摩擦係数、 $\mu_{BP}$ はフィードローラ104とシートS間の摩擦係数、 $\mu_{CP}$ はリタードローラ105とシートS間の摩擦係数、 $\mu_{APP}$ はピックアップローラ103の加圧部下のシートS間の摩擦係数、 $\mu_{BPP}$ はフィードローラ104とリタードローラ105とのニップ部のシートS間の摩擦係数である。

【0016】また、Nはリタードローラ105の加圧力であり、Tはトルクリミッタ113の空転トルクであり、rはリタードローラ105の半径であり、Wはピックアップローラ103の加圧力である。

【0017】

【数1】

$$N > \frac{T}{r \times \mu_{BP}} + \frac{(\mu_{APP} - \mu_{AP}) \times W}{\mu_{BP}} \dots\dots \textcircled{1}$$

【0018】

【数2】

$$N < \frac{T}{r \times \mu_{BPP}} - \frac{2\mu_{APP} \times W}{\mu_{BPP}} \dots\dots \textcircled{2}$$

【0019】

【数3】

$$N < \frac{T}{r \times \mu_{CP}} \dots\dots \textcircled{3}$$

【0020】尚、上記各式中で同一のシートSを用いれば、各ローラ加圧部の摩擦係数はそれほど大きくばらつくことはないため、 $\mu_{APP} \approx \mu_{BPP} = \mu_{PP}$ と置き換えると、前記①、②式は夫々以下の④、⑤式となる。

【0021】

【数4】

$$N > \frac{T}{r \times \mu_{BP}} + \frac{(\mu_{PP} - \mu_{AP}) \times W}{\mu_{BP}} \dots\dots \textcircled{4}$$

【0022】

【数5】

$$N < \frac{T}{r \times \mu_{PP}} - 2W \dots\dots \textcircled{5}$$

【0023】上記③、④、⑤式の関係をリタードローラ105の加圧力Nとトルクリミッタ113の空転トルクTをパラメータとしてグラフ化したものを図7に示す。同図において斜線部領域がシートSの適正給送領域Aである。即ち、適正給送領域Aを拡大するためには各ローラとシートS間の摩擦係数を大きくするかピックアップローラ103の加圧力を小さくすることが必要となる。

【0024】また、リタードローラ105の加圧力Nとトルクリミッタ113の空転トルクTを共に大きくする方向(図7の右上方向)の条件下にシートSの給送条件を設定した方が適正給送領域Aが広くなる。

【0025】ただし、トルクリミッタ113の空転トルクTをむやみに大きくすると、ローラ駆動における負荷トルクが増大するため、適正給送領域Aの上限(図7の右上の限界)もある程度の制約を受けることになる。

【0026】近年の画像形成装置本体の高速化に伴い、画像形成部へシートSを供給するシート給送装置101にも高速化が要求されてきている。そして、当然のことながら高速になればなるほどシートSの給送性能の信頼性を確保することが困難になる。

【0027】特にシート収納装置102からのシートSのピックアップ時間が短くなるためピックアップローラ103の搬送力を大きめに設定する必要がある。しかし、そ

40

50

特開2000-191169  
(P2000-191169A)

(4)

うすると、今度は重送が発生し易くなるという問題がある。

【0028】その理由はピックアップローラ103の搬送力を上げるためにピックアップローラ103とシートSとの摩擦係数を大きなものとするか、ピックアップローラ103の加圧力を大きくするしかないが、ピックアップローラ103の材質を変更することによって摩擦係数を大きく変化させるのは困難であり、どうしても加圧力を大きくする手段を用いることが多い。

【0029】しかし、ピックアップローラ103の加圧力が大きくなるとシート収納装置102の最上位のシートSとその下のシートSとの間の摩擦力も大きくなるため、最上位のシートSを1枚のみピックアップすることが困難となり、最上位のシートSがその下のシートSを引き連れて搬送され、フィードローラ104とリタードローラ105とのニップ部にシートSが複数枚束になって搬送される。

【0030】このシートSの束はリタードローラ105の逆転により1枚ずつに分離されることになるが、あまりに多くのシートSが同時に束で進入するとその分離能力の限界を超てしまい重送する。特に最近では多種多様なシートSが存在し、シートSの種類によってはシートS間の摩擦係数が通常よりも非常に大きいものも存在する。

【0031】そのため、従来のシート給送装置101では図5に示すように、シート収納装置102よりもシート給送方向下流側（以下、単に「下流側」という）でフィードローラ104とリタードローラ105とのニップ部よりもシート給送方向上流側（以下、単に「上流側」という）に配置され、ピックアップローラ103により給送されるシートSの搬送経路117上に突出され、シートSに当接してシートSを分離するプレ分離板118を設けている。

【0032】プレ分離板118はピックアップローラ103により複数枚のシートSが給送された時、本来のフィードローラ104とリタードローラ105からなるリタード分離機構の手前側でシートS束の先端を前述したプレ分離板118に当接させて先端位置をずらして捌くことで、ある程度分離し易くするものである。

【0033】しかし、このプレ分離板118の搬送経路117への突出量やシートSに対する当接角度を大きくすると、ピックアップローラ103によって給送出来なくなる虞があるためフィードローラ104とリタードローラ105とのニップ部へのシートS束の進入を完全に防止するほどの効果を期待することは出来ず、あくまで本来のフィードローラ104とリタードローラ105からなるリタード分離機構の補助的なものであるが、分離性が極端に悪いシートS以外では該リタード分離機構と組み合わせることにより十分な効果が得られる。

【0034】

【発明が解決しようとする課題】しかしながら、前述の

5

従来例では、極端に分離性の悪いシートSや剛性の高いシートS等がプレ分離板118では捌ききれず、束でフィードローラ104とリタードローラ105とのニップ部に進入した場合、リタードローラ105が逆転することによりリタードローラ105側のシートSを戻し搬送するが、プレ分離板118が逆にシートSを戻す力に対して抵抗となり、分離性能を低下させてしまうという問題がある。

【0035】本発明は前記課題を解決するものであり、その目的とするところは、シート載置手段から複数枚のシートが束となって給送された場合にリタード分離手段の手前でシート束を捌いて分離しながらも分離回転体による束搬送されたシートの戻し搬送を妨げない分離部材を設けることで多様化するシートに対しても重送等の給送不良を防止することが出来るシート給送装置及びこれを備えた画像形成装置を提供せんとするものである。

【0036】

【課題を解決するための手段】前記目的を達成するための本発明に係る代表的な構成は、シートを載置するシート載置手段と、前記シート載置手段に載置されたシートを給送するシート給送手段と、前記シート給送手段よりもシート給送方向下流側に配置され、該シート給送手段により給送されたシートを搬送する搬送回転体と、前記搬送回転体に対向して配置され、該搬送回転体との協働作用によりシートを分離する分離回転体と、前記シート載置手段よりもシート給送方向下流側で、且つ前記搬送回転体と前記分離回転体とのニップ部よりもシート給送方向上流側に配置され、前記シート給送手段により給送されるシートの搬送経路上に突出し、該シートに当接してシートを分離する分離部材と、前記分離部材を前記シート給送手段により給送されるシートの搬送経路上に突出させる突出位置と、該搬送経路上から退避する退避位置とに移動させる移動手段とを有することを特徴とするシート給送装置である。

【0037】本発明は、上述の如く構成したので、移動手段により分離部材をシート給送手段により給送されるシートの搬送経路上に突出させる突出位置と、該搬送経路上から退避する退避位置とに移動させることでシート載置手段から複数枚のシートが束となって給送された場合にリタード分離手段の手前で分離部材をシート給送手段により給送されるシートの搬送経路上に突出させる突出位置に保持してシート束を捌いて分離し、分離回転体により束搬送されたシートの戻し搬送を行う際には該搬送経路上から退避する退避位置に移動させてシートの戻し搬送を妨げることがない。

【0038】これにより、多様化するシートに対しても重送等の給送不良を防止することが出来る。

【0039】

【発明の実施の形態】図により本発明に係るシート給送装置及びこれを備えた画像形成装置の一例として複写機に適用した場合の一実施形態を具体的に説明する。図1

は本発明に係るシート給送装置を備えた画像形成装置の構成を示す断面説明図、図2は本発明に係るシート給送装置の第1実施形態の構成を示す要部拡大図である。

【0040】図1において、本発明に係るシート給送装置を備えた画像形成装置は、画像形成装置本体1の一側部に紙や合成樹脂等で構成される多量のシートSを積載収容したシート載置手段となるシート給送デッキ2を備える他、画像形成装置本体1内の下部に所定量のシートSを積載収容した同じくシート載置手段となる複数のシートカセット3, 4を備えている。

【0041】そして、シートSを給送するためのシート給送デッキ2及びシートカセット3, 4の設置部位にはリタード分離機構を構成するシート給送手段となるピックアップローラ5, 6, 7及び搬送回転体となるフィードローラ8, 9, 10及び分離回転体となるリタードローラ11, 12, 13が設けられている。

【0042】シート給送デッキ2、シートカセット3, 4内のシートSは夫々のピックアップローラ5, 6, 7によって繰り出され、詳しくは図2に示して後述する分離部材となるプレ分離板32に当接して捌かれて分離された後、フィードローラ8, 9, 10及びリタードローラ11, 12, 13により分離給送されて一旦停止しているレジストローラ対14に送られて斜行状態の矯正が行われる。

【0043】一方、画像読取装置15により原稿画像が読み取られ、画像情報に応じたレーザ光が画像形成手段となる電子写真感光体ドラム16上に照射されると静電潜像が形成され、現像機17によりトナーが供給されてトナー画像が形成される。

【0044】感光体ドラム16上に形成される静電潜像とのタイミングをとって回転するレジストローラ対14によりシートSが感光体ドラム16とこれに對向する転写帶電器18との間に送られ、転写帶電器18の作用により感光体ドラム16上のトナー画像がシートSに転写される。

【0045】この後、シートSは搬送ベルト19により定着器20に送られ、加熱、加圧処理されてシートSに転写されたトナー画像が永久定着される。本画像形成装置本体1はシートSへの両面複写を行う両面複写モードと多重複写を行う多重複写モードを備えているが、通常複写モードの場合、定着処理後のシートSは内排出ローラ対21により機外の排出トレイ22上に排出される。

【0046】また、両面複写モード及び多重複写モードの場合には、内排出ローラ対23またはスイッチバックローラ対24により再給送バス25及び両面搬送バス26を介して中間トレイ27上に一時的に積載収容される。

【0047】そして、中間トレイ27上に収容されたシートSは再給送装置28により再びレジストローラ対14に搬送され、上記片面複写と同様のプロセスを経て画像が形成されて機外に排出される。

【0048】図2はリタード分離機構周辺要部を示す図である。図2において、シート載置手段となるシート給

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送デッキ2及びシートカセット3, 4に載置されたシートSは夫々シート給送手段となるピックアップローラ5, 6, 7により繰り出され、該ピックアップローラ5, 6, 7よりもシート給送方向下流側（以下、単に「下流側」という）に配置された搬送回転体となるフィードローラ8, 9, 10と、該フィードローラ8, 9, 10に夫々対向して配置された分離回転体なるリタードローラ11, 12, 13との協働作用により1枚ずつに分離給送され、シートカセット3, 4では搬送ローラ対29, 30を介してレジストローラ対14に送られ、シート給送デッキ2では直接レジストローラ対14に送られる。

【0049】尚、フィードローラ8, 9, 10及びリタードローラ11, 12, 13のリタード分離機構の駆動系等の構成は図6に示して前述した従来例と略同じであるため説明を省略する。

【0050】シート給送デッキ2、シートカセット3, 4よりも下流側で且つ各フィードローラ8, 9, 10とリタードローラ11, 12, 13との夫々のニップ部よりもシート給送方向上流側（以下、単に「上流側」という）には、ピックアップローラ5, 6, 7により給送されるシートSの搬送経路31上に突出し、シートSに当接してシートSを分離する分離部材となるプレ分離板32が設けられている。

【0051】プレ分離板32はそれ自体が揺動手段であつて回転軸32aを中心に回動可能に設けられ、ねじりコイルバネ33により常時搬送経路31上に突出する突出位置に付勢して保持されている。一方、ピックアップローラ5, 6, 7はフィードローラ8, 9, 10のフィードローラ軸8a, 9a, 10aを中心に回動可能な揺動手段となるピックアップローラ支持部材34に回転可能に支持され、図示しない加圧手段によりシート給送デッキ2、シートカセット3, 4に夫々載置されたシートSに所定の加圧力により当接している。

【0052】プレ分離板32及びピックアップローラ支持部材34に当接係合する位置には回転軸35aを中心に回動可能なリンク35が設けられており、該リンク35の一端がソレノイド36に連結されている。

【0053】ソレノイド36及びリンク35によりプレ分離板32を搬送経路31上に突出させる突出位置と、搬送経路31上から退避する退避位置とに移動させる移動手段を構成している。

【0054】そして、ソレノイド36をONにしてリンク35を回転軸35aを中心に図2の時計回り方向に回動させると、該リンク35の一端がピックアップローラ支持部材34の下面に当接して該ピックアップローラ支持部材34をフィードローラ軸8a, 9a, 10aを中心に図示しない加圧手段の加圧力に抗して図2の反時計回り方向に回動してシート給送デッキ2、シートカセット3, 4に載置されたシートSから離間する。

【0055】これと同時にリンク35の他の一端がプレ分

特開2000-191169  
(P2000-191169A)

(6)

8

離板32の起立片に当接して該プレ分離板32を回動軸32aを中心にはじりコイルバネ33の付勢力に抗して図2の反時計回り方向に回動して搬送経路31上から退避させる。

【0056】上記構成において、シート給送デッキ2あるいはシートカセット3、4に載置されたシートSを給送する時、ピックアップローラ5、6、7は図2の実線で示すように最上位のシートSの表面に当接している。

【0057】この状態では回動可能に支持されたプレ分離板32はねじりコイルバネ33により図2の実線で示す突出位置に付勢されている。そして、シートS間の摩擦係10数が大きい場合やピックアップローラ5、6、7の加圧力が大きい場合等に該ピックアップローラ5、6、7により複数枚のシートSが束でピックアップされると、シートS束の先端がプレ分離板32に当接して捌かれ、搬送経路31の上部でプレ分離板32の上端を超えた搬送経路31'を通ってフィードローラ8、9、10とリタードローラ11、12、13との夫々のニップ部にシートSが搬送される。

【0058】そして、シートSの先端がフィードローラ8、9、10とリタードローラ11、12、13により夫々挟持20されると、ソレノイド36が作動し、リンク35によりピックアップローラ支持部材34が図2の破線で示す離間位置に持ち上げられ、ピックアップローラ5、6、7が給送位置から退避する。

【0059】これと同時にリンク35によりプレ分離板32も図2の破線で示す退避位置に倒され、プレ分離板32によりシートS束が捌ききれずにフィードローラ8、9、10とリタードローラ11、12、13との夫々のニップ部に束で進入したとしてもプレ分離板32は搬送経路31から退避しているので、リタードローラ11、12、13が逆転して下30位のシートSを戻し搬送する際の妨げにならない。

【0060】上記のように、シートSの搬送状態に応じて給送動作開始のピックアップローラ5、6、7が回転するピックアップ動作時にはプレ分離板32を搬送経路31上に突出させ、リタードローラ11、12、13が逆回転して下位のシートSを戻し搬送するリタード分離動作時にはプレ分離板32を搬送経路31上から退避させて重送が発生する確率を低下させることが出来る。

【0061】次に図3及び図4を用いて本発明に係るシート給送装置の第2実施形態について説明する。図3は40本発明に係るシート給送装置の第2実施形態の構成を示す要部拡大図、図4は第2実施形態において分離部材を移動する移動手段の構成を示す斜視説明図である。尚、前記第1実施形態と同様に構成されたものは同一の符号を付して説明を省略する。

【0062】前記第1実施形態ではピックアップローラ5、6、7のシートSからの離間動作と連動して常にプレ分離板32を揺動させたものであるが、本実施形態ではリタードローラ11、12、13の回転方向によりシートSの搬送状態を検知し、自動でプレ分離板32を揺動させるも50

のである。

【0063】分離部材となるプレ分離板32は前記第1実施形態と同様に回動軸32aを中心に回動可能に軸支されており、ねじりコイルバネ33により図3の破線で示す退避位置に付勢されている。

【0064】また、ねじりコイルバネ33によりプレ分離板32が付勢される側にはプレ分離板32に当接係合して該プレ分離板32を搬送経路31上に突出させる突出位置と、搬送経路31上から退避する退避位置とに移動させる移動手段となるカム41が設けられている。

【0065】図4に示すように、カム41の回転軸41aはトルクリミッタ42及びギア列43を介してリタードローラ軸11a、12a、13aに連結されている。そして、リタードローラ11、12、13がフィードローラ8、9、10に対して従動回転する時はカム41により図3の実線で示すようにプレ分離板32を搬送経路31上に突出した状態に保持する。

【0066】尚、プレ分離板32は図示しない突き当部材に突き当たることにより図3の実線で示す突出位置以上には回動しないようになっており、カム41も図4に示すように回転軸41aに設けられたトルクリミッタ42とストッパー44が図示しない突き当部材に突き当たることにより図3に示す破線と実線の範囲内で回動可能に構成されている。

【0067】シートSを給送する時、先ず、ピックアップローラ5、6、7は図3の実線で示すようにシート給送デッキ2、シートカセット3、4に積載されている最上位のシートSに当接している。

【0068】そして、最初の給送動作、若しくはピックアップローラ5、6、7がシートSを1枚のみフィードローラ8、9、10とリタードローラ11、12、13とのニップ部に送り出している場合はリタードローラ軸11a、12a、13aはフィードローラ8、9、10に対して従動回転し、リタードローラ軸11a、12a、13aに軸支されたギア列43を介してカム41が回動可能に支持されたプレ分離板32を図3の実線で示す突出位置に付勢する。

【0069】そして、積載しているシートS間の摩擦係数が大きい場合やピックアップローラ5、6、7の加圧力が大きい場合等にピックアップローラ5、6、7によりシート給送デッキ2、あるいはシートカセット3、4から複数枚のシートSが束でピックアップされると、その先端がプレ分離板32に当接して該プレ分離板32により捌かれ、搬送経路31よりも上部でプレ分離板32の上端部を超えた搬送経路31'を通ってフィードローラ8、9、10とリタードローラ11、12、13とのニップ部にシートSが搬送される。

【0070】そして、シートSの先端がフィードローラ8、9、10とリタードローラ11、12、13により挟持されると、ソレノイド36が作動し、リンク35によりピックアップローラ支持部材34が図3の破線で示す位置に持ち上

特開2000-191169  
(P2000-191169A)

(7)

10

げられ、ピックアップローラ5, 6, 7がシートSから離間して給送位置から退避する。

【0071】そして、プレ分離板32でシートS束が捌ききれずにフィードローラ8, 9, 10とリタードローラ1, 12, 13とのニップ部に束で進入した場合にはリタードローラ軸11a, 12a, 13aはフィードローラ8, 9, 10に対して逆回転し、該リタードローラ軸11a, 12a, 13aに軸支されたギア列43を介してカム41がプレ分離板32を図3の破線で示す退避位置に倒す。

【0072】これにより、プレ分離板32は本来の搬送経路31よりも下がっているので、リタードローラ11, 12, 13が逆回転して複数枚連れ込まれた下位のシートSが戻し搬送される際の妨げにならない。

【0073】また、事前の給送動作でフィードローラ8, 9, 10とリタードローラ11, 12, 13とのニップ部までシートSが複数搬送され、プレ分離板32が退避位置にあったとしても次の給送動作で前記ニップ部にシートSが1枚のみ搬送されていれば再びプレ分離板32が突出位置に戻り、該ニップ部に複数枚搬送されればプレ分離板32は退避位置のままでリタードローラ11, 12, 13の逆回転による連れ込まれたシートSの戻し搬送を妨げない。

【0074】このように、常にシート給送装置のフィードローラ8, 9, 10とリタードローラ11, 12, 13とのリタード分離機構のリタード分離動作に伴い、プレ分離板32が必要な時に突出し、リタード分離動作が機能する時にはその妨げにならないように退避するので重送の発生確率を低下させることが出来る。

【0075】

【発明の効果】本発明は、上述の如き構成と作用とを有するので、搬送回転体と分離回転体を用いたリタード分離方式のシート給送装置において分離部材を移動可能に支持することにより分離部材による分離動作が必要な時に分離部材を機能させ、リタード分離動作時にはその妨

11

げにならないように分離部材を退避させることにより分離部材による分離動作とリタード分離動作の両方を十分に機能させることが出来、重送の発生確率を低下させることが出来る。

【図面の簡単な説明】

【図1】本発明に係るシート給送装置を備えた画像形成装置の構成を示す断面説明図である。

【図2】本発明に係るシート給送装置の第1実施形態の構成を示す要部拡大図である。

【図3】本発明に係るシート給送装置の第2実施形態の構成を示す要部拡大図である。

【図4】第2実施形態において分離部材を移動する移動手段の構成を示す斜視説明図である。

【図5】従来例を説明する図である。

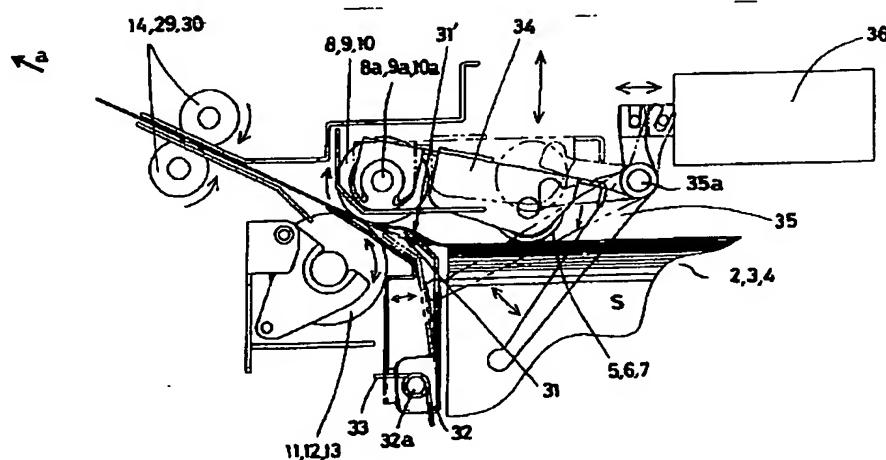
【図6】従来例を説明する図である。

【図7】従来例を説明する図である。

【符号の説明】

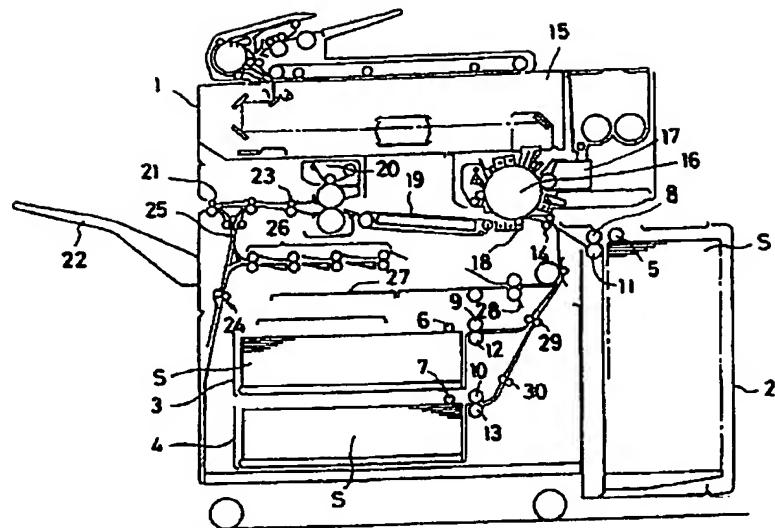
1…画像形成装置本体、2…シート給送デッキ、3, 4…シートカセット、5, 6, 7…ピックアップローラ、8, 9, 10…フィードローラ、8a, 9a, 10a…フィードローラ軸、11, 12, 13…リタードローラ、11a, 12a, 13a…リタードローラ軸、14…レジストローラ対、15…画像読み取り装置、16…感光体ドラム、17…現像機、18…転写帶電器、19…搬送ベルト、20…定着器、21…内排出ローラ対、22…排出トレイ、23…内排出ローラ対、24…スイッチバックローラ対、25…再給送バス、26…両面搬送バス、27…中間トレイ、28…再給送装置、29, 30…搬送ローラ対、31…搬送経路、32…プレ分離板、32a…回転軸、33…ねじりコイルバネ、34…ピックアップローラ支持部材、35…リンク、35a…回転軸、36…ソレノイド、41…カム、41a…回転軸、42…トルクリミッタ、43…ギア列、44…ストッパー、S…シート

【図2】

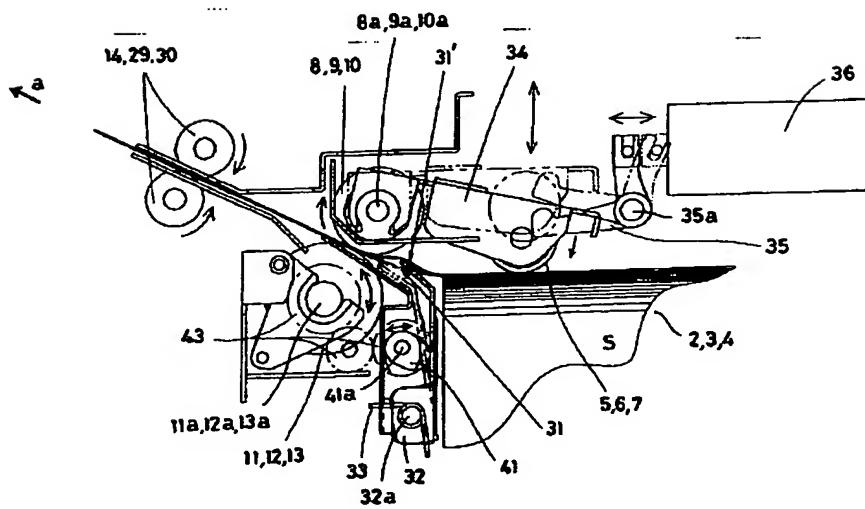


特開2000-191169  
(P2000-191169A)

【図1】

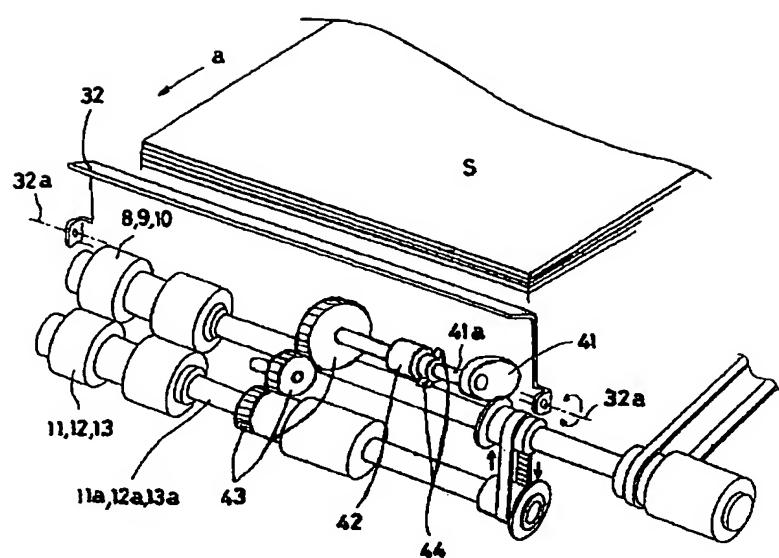


【図3】

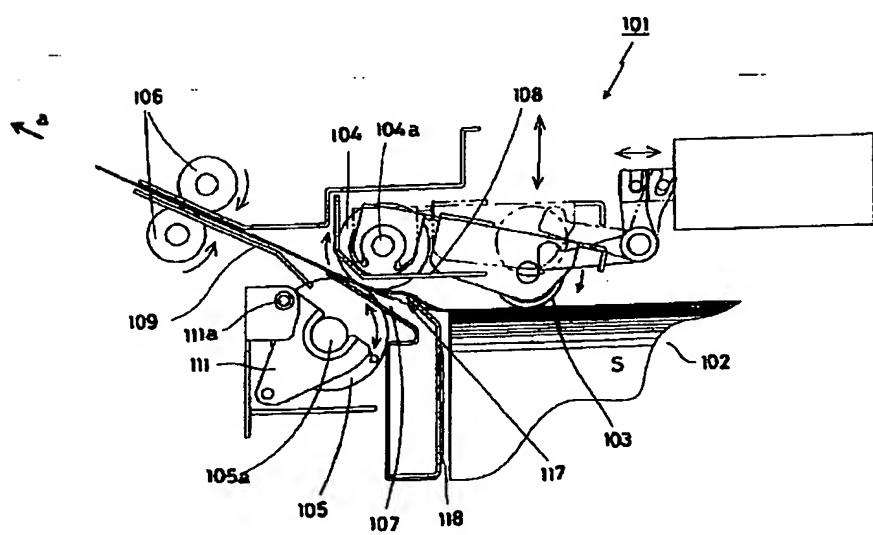


特開2000-191169  
(P2000-191169A)

【図4】



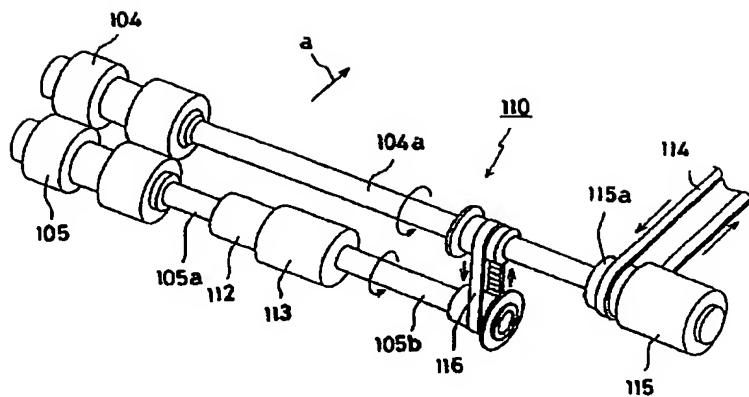
【図5】



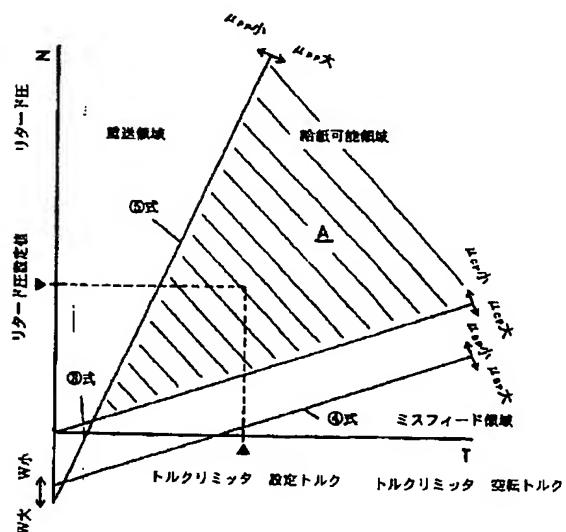
特開2000-191169  
(P 2000-191169A)

( 10 )

【図6】



【図7】



## SHEET FEEDER AND IMAGE FORMATION DEVICE

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Inventor(s): MIURA YUKIHIRO

Applicant(s): CANON INC

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IPC Classification: B65H3/56

EC Classification:

Equivalents:

### Abstract

**PROBLEM TO BE SOLVED:** To provide a sheet feeder capable of preventing a feeding failure of overlapped feeding, etc., even against a diversified sheet by providing a separation member not to interrupt returning carriage of sheets carried in a bundle by a separation rotor even while handling and separating a sheet bundle before a retard separation means in the case when a plural number of the sheets are fed in a bundle from a sheet placing means and a image formation device furnished with it.

**SOLUTION:** A pre-separation plate 32 is provided free to revolve around an axis of revolution 32a as its center, and it is constantly urged to a position to project on a carrier passage 31 by a torsion coil spring 33. It is constituted so as to separate pick-up rollers 5, 6, 7 from a sheet S by a link 35 driven by a solenoid 36 and to oscillate a pick-up roller support member 34 and to refuge from the carrier passage 31 by pushing down the pre-separation plate 32 simultaneously.

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**CLAIMS**

**[Claim(s)]**

[Claim 1] The sheet feeding device characterized by providing the following. A sheet installation means to lay a sheet. A sheet feed means to feed with the sheet laid in the aforementioned sheet installation means. Conveyance body of revolution which conveys the sheet with which has been arranged at the sheet feed direction downstream and it was fed by this sheet feed means rather than the aforementioned sheet feed means. Rather than the separation body of revolution which counters the aforementioned conveyance body of revolution, is arranged, and separates a sheet by collaboration operation with this conveyance body of revolution, and the aforementioned sheet installation means, by the sheet feed direction downstream. And the separation member which is arranged at the sheet feed direction upstream, projects on the conveyance path of the sheet with which it is fed by the aforementioned sheet feed means, and separates a sheet from the nip section of the aforementioned conveyance body of revolution and the aforementioned separation body of revolution in contact with this sheet. The move means moved to the protrusion position which makes the aforementioned separation member project on the conveyance path of the sheet fed by the aforementioned sheet feed means, and the evacuation position evacuated from on this conveyance path.

[Claim 2] The sheet feeding device according to claim 1 characterized by making it move to the protrusion position made to project on the conveyance path of the sheet fed with the aforementioned separation member by the aforementioned sheet feed means according to the conveyance state of a sheet, and the evacuation position evacuated from on this conveyance path.

[Claim 3] The aforementioned sheet feed means is contacted / estranged by the sheet laid in the aforementioned sheet installation means by the 1st rocking means. The aforementioned separation member is projected / evacuated on the conveyance path of the sheet with which it is fed by the 2nd rocking means by the aforementioned sheet feed means. the alienation from the sheet of the aforementioned sheet feed means -- the sheet feeding device according to claim 1 or 2 characterized by for operation being interlocked with and evacuating the aforementioned separation member from on the conveyance path of a sheet

[Claim 4] The sheet feeding device according to claim 1 or 2 characterized by making the aforementioned separation member project on the conveyance path of a sheet when the aforementioned separation member is evacuated from on the conveyance path of a sheet when the aforementioned separation body of revolution is reversed to the aforementioned conveyance body of revolution, and the aforementioned separation body of revolution follows to the aforementioned conveyance body of revolution.

[Claim 5] It is the sheet feeding device according to claim 4 carry out [ that the interlocking cam evacuates the aforementioned separation member from on the conveyance path of a sheet to rotation of the aforementioned separation body of revolution when the aforementioned separation member is projected / evacuated on the conveyance path of the sheet with which it is fed by the rocking means by the aforementioned sheet feed means and the aforementioned separation body of revolution reverses to the aforementioned conveyance body of revolution, and ] as the feature.

[Claim 6] Image formation equipment characterized by having an image formation means to equip any 1 term of claims 1-5 with the sheet feeding device of a publication, and to form a picture in a sheet according to image information.

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[Translation done.]

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] this invention relates to the sheet feeding device with which image formation equipments, such as a copying machine, and a printer, facsimile, are equipped.

[0002]

[Description of the Prior Art] An example of the conventional sheet feeding device is explained using drawing 5 - drawing 7 . drawing 5 -- setting -- sheet feeding device 101 Sheet receipt equipment 102 with which the sheet S of two or more sheets was accumulated and contained on the sheet installation base which is not illustrated from -- pickup roller 103 which feeds with one sheet S of the most significant at a time this pickup roller 103 Sheet receipt equipment 102 from -- feed roller 104 which conveys the sheet S with which it was fed into the main part of image formation equipment (the direction of arrow a of drawing 5 ) this feed roller 104 Retard roller 105 countered and arranged the conveyance roller pair arranged at the near side of the main part of image formation equipment -- 106 It has.

[0003] Pickup roller 103 When the number of the sheets S with which it was fed is [ two or more ], it is the retard roller 105. Feed roller 104 It rotates to a hand of cut and an opposite direction (the direction of arrow b of drawing 5 ), the low-ranking sheet S is returned and conveyed, and the separation feed only of the one sheet of the most significant is carried out.

[0004] moreover, pickup roller 103 Feed roller 104 And sheet passage field 107 between the retard rollers 105 \*\*\*\* -- upper guide 108 it arranges -- having -- a feed roller 104 and retard roller 105 Conveyance roller pair 106 Between and conveyance roller pair 106 between the main parts of image formation equipment -- lower guide 109 It is arranged. And upper guide 108 Lower guide 109 It is guided and fed with Sheet S.

[0005] Feed roller 104 And retard roller 105 Drive transport unit 110 shown in drawing 6 It drives. drive transport unit 110 \*\*\*\* -- feed roller 104 Feed roller shaft 104a supported to revolve and retard roller 105 Retard roller driving shaft 105b connected with retard roller shaft 105a and this retard roller shaft 105a which are supported to revolve is arranged at abbreviation parallel.

[0006] Retard roller shaft 105a is the supporter material 111 which can be rocked focusing on rotation shaft 111a, as shown in drawing 5 . It is supported and can attach and detach in parallel to feed roller shaft 104a. Moreover, between retard roller shaft 105a and retard roller driving shaft 105b, it is distributor shaft coupling 112. And torque limiter 113 It is prepared.

[0007] The main driving means of the main part of image formation equipment which is not illustrated in the edge of feed roller shaft 104a to driving-input belt 114 Electromagnetic clutch 115 which transmits the driving force transmitted by minding to feed roller shaft 104a It is prepared.

[0008] Moreover, retard driving belt 116 which transmits the rotation driving force transmitted to feed roller shaft 104a between feed roller shaft 104a and retard roller driving shaft 105b to retard roller driving shaft 105b It is wound almost. In addition, distributor shaft coupling 112 Retard roller 105 Even if it displaces, it is for transmitting a drive to retard roller shaft 105a from retard roller driving shaft

105b.

[0009] The above-mentioned drive transport unit 110 Feed roller 104 to depend And retard roller 105 When a drive is explained, the rotation driving force first given from the main driving means of the main part of image formation equipment which is not illustrated is the driving-input belt 114. Electromagnetic clutch 115 by which is transmitted and ON/OFF control is carried out according to the feed timing of Sheet S It is inputted into pulley 115a prepared in the amateur section.

[0010] Here, it is an electromagnetic clutch 115. The Rota section, feed roller shaft 104a which rotates in one, retard roller driving shaft 105b, and retard roller shaft 105a are the retard driving belt 116. Since it is connected, feed roller shaft 104a, retard roller shaft 105a, and retard roller driving shaft 105b rotate in this direction, and it is a feed roller 104. Retard roller 105 A rotation drive is carried out synchronizing with the time of the feed timing ON of Sheet S.

[0011] the above-mentioned drive transport unit 110 the time of one sheet S being sent at a time in the feed direction (drawing 5 and the direction of arrow a of drawing 6 ) -- retard roller 105 Feed roller 104 and the frictional force between Sheets S -- torque limiter 113 It races and rotates to the drive hand of cut and opposite direction of retard roller driving shaft 105b.

[0012] Moreover, when fed with the sheet S of two or more sheets, it is the retard roller 105. Torque limiter 113 since the frictional force between the sheets S of two or more sheets is small to the frictional force between Sheets S It is the retard roller 105, without racing. It rotates in the rotation driving direction and this direction of retard roller driving shaft 105b.

[0013] Feed roller 104 in the sheet S sent two or more sheets by this The low-ranking sheet S is separated from the sheet S of the most significant, and it a side, and \*\*\*\* of the sheet S into the main part of image formation equipment is prevented.

[0014] Next, sheet feeding device 101 of the above-mentioned composition The principle which satisfies the separation feed conditions of the sheet S to twist is explained. For feed conditions and \*\* formula, separation conditions and \*\* are [ the following \*\* formulas ] the retard roller 105. The relational expression with which it is satisfied of the circumference conditions of a companion, respectively is shown.

[0015] In addition, in following \*\*, \*\*, and \*\* formula, muAP is coefficient of friction between the sheets S of the nip section with a pickup roller 103. Coefficient of friction between Sheets S and muBP are a feed roller 104. Coefficient of friction between Sheets S and muCP are the retard roller 105. Coefficient of friction between Sheets S, and muAPP Pickup roller 103 Coefficient of friction between a pressurization subordinate's sheets S, and muBPP Feed roller 104 Retard roller 105

[0016] Moreover, N is the retard roller 105. It is welding pressure and T is a torque limiter 113. It is

idle torque and  $r$  is the retard roller 105. It is a radius and  $W$  is a pickup roller 103. It is welding pressure.

[0017]

[Equation 1]

[0018]

**[Equation 2]**

[0019]

[Equation 3]

[0020] In addition, if the same sheet S is used in each above-mentioned formula and it will replace with  $\mu_{APP} \cdot \mu_{BPP} = \mu_{PP}$  since coefficient of friction of each roller pressurization section does not vary so greatly, the aforementioned  $\mu_{APP}$  and  $\mu_{BPP}$  formula will turn into  $\mu_{PP}$  of the following, and  $\mu_{PP}$  formula, respectively.

[0021]

[Equation 4]

[0022]

### [Equation 5]

[0023] It is the retard roller 105 about the relation of the above-mentioned \*\*, \*\*, and \*\* formula. Welding pressure N and torque limiter 113 What made idling torque T the parameter and graph-ized it is shown in drawing 7 . In this drawing, a slash section field is the proper feed field A of Sheet S. That is, in order to expand the proper feed field A, coefficient of friction between each roller and Sheet S is enlarged, or it is a pickup roller 103. It is necessary to make welding pressure small.

[0024] Moreover, retard roller 105 Welding pressure N and torque limiter 113 The proper feed field A becomes [ the direction which set the feed conditions of Sheet S to the bottom of the condition of the direction (the direction of the upper right of drawing 7 ) which both enlarges idling torque T ] large.

[0025] However, torque limiter 113 If idling torque  $T$  is enlarged recklessly, since the load torque in a roller drive will increase, a certain amount of [ the upper limit (limitation at the upper right of drawing 7 ) of the proper feed field A ] restrictions will be received.

[0026] Sheet feeding device 101 which supplies Sheet S to the image formation section with improvement in the speed of the main part of image formation equipment in recent years Improvement in the speed has been required. And as it becomes high-speed with a natural thing, it becomes more difficult to secure the reliability of the feed performance of Sheet S.

[0027] It is especially sheet receipt equipment 102. Since the pick up time of the sheet S of a shell becomes short, it is a pickup roller 103. It is necessary to set up the conveyance force more greatly. However, when it does so, there is a problem of becoming easy to generate \*\*\* shortly.

[0028] The reason is a pickup roller 103. In order to raise the conveyance force, it is a pic

[0025] The reason is a pickup roller 103 in order to make the conveying roller 101, and a pickup roller 103. Coefficient of friction with Sheet S is made big, or it is a pickup roller 103. Although welding pressure must be enlarged, it is a pickup roller 103. By changing the quality of the material, it is difficult to change coefficient of friction a lot, and the means which surely enlarges welding pressure is used in many cases.

[0029] However, pickup roller 103 It becomes difficult to accept one sheet S of the most significant and to take it up, since the frictional force between the sheet S of the most significant of sheet receipt equipment 102 and the sheet S under it will also become large if welding pressure becomes large, the sheet S of the most significant takes the sheet S under it with it, and is conveyed, and it is a feed roller 104. Retard roller 105 Sheet S becomes two or more sheet bunch, and is conveyed by the nip section.

[0030] The bunch of this sheet S is the retard roller 105. Although an inversion will separate into one sheet at a time, if too much many sheets S advance in a bundle simultaneously, the limitation of the separative power is exceeded and \*\*\*\*\*(ed). Especially a variety of sheets [ recently ] S exist, and what has very larger coefficient of friction between Sheets S than usual exists depending on the kind of sheet S.

[0031] therefore, the conventional sheet feeding device 101 \*\*\*\* -- it is shown in drawing 5 -- as -- sheet receipt equipment 102 The sheet feed direction downstream It is a feed roller 104 at (it is only hereafter called a "downstream"). Retard roller 105 Rather than the nip section, the sheet feed direction

upstream It is arranged (it is only hereafter called an "upstream"), and is a pickup roller 103. Conveyance path 117 of the sheet S with which it is fed Pre division plate 118 which is projected upwards and separates Sheet S in contact with Sheet S It has prepared.

[0032] pre division plate 118 Pickup roller 103 the time of being fed with the sheet S of two or more sheets -- original feed roller 104 Retard roller 105 from -- pre division plate 118 which mentioned above the nose of cam of S bundles of sheets in the near side of the becoming retard separation mechanism It is made to some extent easy to be making it contact, and shifted and dealing with a nose-of-cam position, and to separate.

[0033] However, this pre division plate 118 Conveyance path 117 If the contact angle to the amount of protrusions or Sheet S is enlarged Pickup roller 103 Since there is a possibility that it may become impossible to feed, it is a feed roller 104. Retard roller 105 An effect to the extent that penetration of S bundles of sheets to the nip section is prevented completely is not expectable. to the last -- original feed roller 104 Retard roller 105 from -- although the becoming retard separation mechanism is auxiliary, except the sheet S with extremely bad separability, sufficient effect is acquired by combining with this retard separation mechanism

[0034]

[Problem(s) to be Solved by the Invention] However, at the above-mentioned conventional example, the sheet S with extremely bad separability, the rigid high sheet S, etc. are the pre division plate 118. It cannot finish selling then. It is a feed roller 104 at a bunch. Retard roller 105 When it advances into the nip section, it is the retard roller 105. It is the retard roller 105 by reversing. Although the near sheet S is returned and conveyed Pre division plate 118 It is resisting to the force of returning Sheet S conversely, and there is a problem of reducing separability ability.

[0035] The place which this invention solves the aforementioned technical problem and is made into the purpose Dealing with a sheet bunch and dissociating before a retard separation means, when the sheet of two or more sheets becomes a bunch from a sheet installation means and it is fed Let image formation equipment equipped with the sheet feeding device and this which can prevent poor feed, such as \*\*\*\*, also to the sheet diversified by preparing the separation member which does not bar return conveyance of a sheet by \*\*\*\*\* body of revolution by which bunch conveyance was carried out be an offer plug.

[0036]

[Means for Solving the Problem] The typical composition concerning this invention for attaining the aforementioned purpose A sheet installation means to lay a sheet, and a sheet feed means to feed with the sheet laid in the aforementioned sheet installation means, The conveyance body of revolution which conveys the sheet with which has been arranged at the sheet feed direction downstream and it was fed by this sheet feed means rather than the aforementioned sheet feed means, Rather than the separation body of revolution which counters the aforementioned conveyance body of revolution, is arranged, and separates a sheet by collaboration operation with this conveyance body of revolution, and the aforementioned sheet installation means, by the sheet feed direction downstream And the separation member which is arranged at the sheet feed direction upstream, projects on the conveyance path of the sheet with which it is fed by the aforementioned sheet feed means, and separates a sheet from the nip section of the aforementioned conveyance body of revolution and the aforementioned separation body of revolution in contact with this sheet, It is the sheet feeding device characterized by having the move means moved to the protrusion position which makes the aforementioned separation member project on the conveyance path of the sheet fed by the aforementioned sheet feed means, and the evacuation position evacuated from on this conveyance path.

[0037] The protrusion position made to project on the conveyance path of the sheet fed with a separation member by the move means by the sheet feed means since this invention was constituted like \*\*\*\*, When the sheet of two or more sheets becomes a bunch from a sheet installation means and it is fed by making it move to the evacuation position evacuated from on this conveyance path, a separation member before a retard separation means by the sheet feed means Hold in the protrusion position made to project on the conveyance path of the sheet with which it is fed, deal with a sheet bunch, dissociate, it is made to move to the evacuation position evacuated from on this conveyance path in case return conveyance of

a sheet in which bunch conveyance was carried out by separation body of revolution is performed, and return conveyance of a sheet is not barred.

[0038] Thereby, poor feed, such as \*\*\* , can be prevented also to the sheet to diversify.

[0039]

[Embodiments of the Invention] 1 operation gestalt at the time of applying to a copying machine as an example of image formation equipment equipped with the sheet feeding device and this which start this invention with drawing is explained concretely. Cross-section explanatory drawing showing the composition of image formation equipment equipped with the sheet feeding device which drawing 1 requires for this invention, and drawing 2 are the important section enlarged views showing the composition of the 1st operation gestalt of the sheet feeding device concerning this invention.

[0040] Image-formation equipment equipped with the sheet feeding device concerning this invention is equipped with the sheet feed deck 2 used as the sheet installation means which carried out loading hold of a lot of sheets S constituted from paper, synthetic resin, etc. by the unilateral section of the main part 1 of image-formation equipment, and also it equips the lower part in the main part 1 of image-formation equipment with two or more sheet cassettes 3 and 4 which carried out loading hold of the sheet S of the specified quantity and which similarly serve as a sheet installation means in drawing 1 .

[0041] And the retard rollers 11, 12, and 13 used as the feed rollers 8, 9, and 10 and separation body of revolution used as the pickup rollers 5, 6, and 7 and conveyance body of revolution used as a sheet feed means to constitute a retard separation mechanism are formed in the installation part of the sheet feed deck 2 for feeding with Sheet S, and the sheet cassettes 3 and 4.

[0042] the resist roller pair which it let out the sheet feed deck 2, the sheet cassette 3, and the sheet S in four with each pickup roller 5, 6, and 7, separation feed was carried out with feed rollers 8, 9, and 10 and the retard rollers 11, 12, and 13 after selling and separating into drawing 2 in detail in contact with the pre division plate 32 used as the separation member shown and mentioned later, and has been stopped -- it is sent to 14 and reform of a skew state is performed

[0043] On the other hand, a manuscript picture is read by the picture reader 15, if the laser beam according to image information is irradiated on the electrophotography photo conductor drum 16 used as an image formation means, an electrostatic latent image will be formed, a toner is supplied by the developing machine 17, and a toner picture is formed.

[0044] the resist roller pair which takes timing with the electrostatic latent image formed on the photo conductor drum 16, and rotates -- it is sent between the imprint electrification machines 18 to which Sheet S counters the photo conductor drum 16 and this by 14, and the toner picture on the photo conductor drum 16 is imprinted by Sheet S by operation of the imprint electrification machine 18

[0045] Then, Sheet S is sent to a fixing assembly 20 with the conveyance belt 19, and permanent fixing of heating and the toner picture which pressure treatment was carried out and was imprinted by Sheet S is carried out. although this main part 1 of image formation equipment is equipped with the double-sided copy mode in which a double-sided copy on Sheet S is performed, and the multiplex copy mode in which a multiplex copy is performed -- usually -- the case in copy mode -- the sheet S after fixing processing -- inner -- it is discharged by eccrisis roller pair 21 on the eccrisis tray 22 outside the plane

[0046] moreover -- the case in double-sided copy mode and multiplex copy mode -- inner -- loading hold is temporarily carried out by eccrisis roller pair 23 or switch back roller pair 24 on the middle tray 27 through the re-feed path 25 and the double-sided conveyance path 26

[0047] and the sheet S held on the middle tray 27 -- the re-feeding device 28 -- again -- a resist roller pair -- it should be conveyed by 14 and pass the same process as the above-mentioned one side copy -- a picture is formed and it is discharged outside the plane

[0048] Drawing 2 is drawing showing a retard separation-mechanism circumference important section. It lets out the sheet S laid in the sheet feed deck 2 and the sheet cassettes 3 and 4 used as a sheet installation means in drawing 2 with the pickup rollers 5, 6, and 7 which serve as a sheet feed means, respectively. The feed rollers 8, 9, and 10 which serve as conveyance body of revolution arranged at the sheet feed direction downstream (only henceforth a "downstream") from these pickup rollers 5, 6, and 7, Separation feed is carried out at a time by collaboration operation with the retard rollers 11, 12, and 13

at one sheet. the separation which countered these feed rollers 8, 9, and 10, respectively, and has been arranged -- body of revolution -- the sheet cassettes 3 and 4 -- a conveyance roller pair -- 29 and 30 -- minding -- a resist roller pair -- it is sent to 14 and direct on the sheet feed deck 2 -- it is sent to resist roller pair 14

[0049] in addition, the conventional example which showed the composition of the drive system of the retard separation mechanism of feed rollers 8, 9, and 10 and the retard rollers 11, 12, and 13 etc. to drawing 6 , and was mentioned above and abbreviation -- since it is the same, explanation is omitted

[0050] It is a downstream from the sheet feed deck 2 and the sheet cassettes 3 and 4. rather than each nip section of each feed rollers 8, 9, and 10 and the retard rollers 11, 12, and 13 The sheet feed direction upstream It projects on the conveyance path 31 of the sheet S with which it is fed with pickup rollers 5, 6, and 7 for (only calling it an "upstream" hereafter), and the pre division plate 32 used as the separation member which separates Sheet S in contact with Sheet S is formed.

[0051] Itself is a rocking means, and the pre division plate 32 is formed possible [ rotation ] focusing on rotation shaft 32a, and is energized and held in the protrusion position which always projects on the conveyance path 31 by the torsion coil spring 33. On the other hand, pickup rollers 5, 6, and 7 were supported possible [ rotation ] by the pickup roller supporter material 34 used as the rocking means which can be rotated centering on the feed roller shafts 8a, 9a, and 10a of feed rollers 8, 9, and 10, and are in contact with the sheet S laid in the sheet feed deck 2 and the sheet cassettes 3 and 4 by the pressurization means which is not illustrated, respectively with predetermined welding pressure.

[0052] The link 35 which can be rotated focusing on rotation shaft 35a is established in the position which carries out contact engagement at the pre division plate 32 and the pickup roller supporter material 34, and the end of this link 35 is connected with the solenoid 36.

[0053] The move means moved to the protrusion position which makes the pre division plate 32 project on the conveyance path 31 by the solenoid 36 and the link 35, and the evacuation position evacuated from on the conveyance path 31 is constituted.

[0054] And if a solenoid 36 is turned ON and a link 35 is rotated in the direction of a clockwise rotation of drawing 2 focusing on rotation shaft 35a The end of this link 35 contacts the inferior surface of tongue of the pickup roller supporter material 34. It estranges from the sheet S which resisted the welding pressure of a pressurization means by which this pickup roller supporter material 34 is not illustrated centering on the feed roller shafts 8a, 9a, and 10a, rotated in the direction of a counterclockwise rotation of drawing 2 , and was laid in the sheet feed deck 2 and the sheet cassettes 3 and 4.

[0055] Other ends of a link 35 twist this pre division plate 32 focusing on rotation shaft 32a simultaneously with this in contact with the piece of standing up of the pre division plate 32, the energization force of a coil spring 33 is resisted, and it rotates in the direction of a counterclockwise rotation of drawing 2 , and is made to evacuate from on the conveyance path 31.

[0056] In the above-mentioned composition, when feeding with the sheet S laid in the sheet feed deck 2 or the sheet cassettes 3 and 4, pickup rollers 5, 6, and 7 are in contact with the front face of the sheet S of the most significant, as the solid line of drawing 2 shows.

[0057] In this state, the pre division plate 32 supported by the rockable is energized by the protrusion position shown as the solid line of drawing 2 by the torsion coil spring 33. And if the sheet S of two or more sheets is taken up in a bundle by these pickup rollers 5, 6, and 7 when coefficient of friction between Sheets S is large, or when the welding pressure of pickup rollers 5, 6, and 7 is large The nose of cam of S bundles of sheets is manipulated in contact with the pre division plate 32, and Sheet S is conveyed by each nip section of feed rollers 8, 9, and 10 and the retard rollers 11, 12, and 13 through conveyance path 31' which exceeded the upper limit of the pre division plate 32 in the upper part of the conveyance path 31.

[0058] and the alienation which a solenoid 36 operates and the pickup roller supporter material 34 shows with the dashed line of drawing 2 by the link 35 when the nose of cam of Sheet S is pinched, respectively with feed rollers 8, 9, and 10 and the retard rollers 11, 12, and 13 -- it is raised in a position and pickup rollers 5, 6, and 7 evacuate from a feed position

[0059] It is pushed down on the evacuation position which also shows the pre division plate 32 with the dashed line of drawing 2 by the link 35 simultaneously with this. Though it advances into each nip section of feed rollers 8, 9, and 10 and the retard rollers 11, 12, and 13 in a bundle, without the ability finishing selling S bundles of sheets by the pre division plate 32, since the pre division plate 32 has evacuated from the conveyance path 31 The retard rollers 11, 12, and 13 are reversed and it does not become the hindrance at the time of returning and conveying the low-ranking sheet S.

[0060] As mentioned above, the pre division plate 32 is made to project on the conveyance path 31 at the time of pickup operation which the pickup rollers 5, 6, and 7 of a feed operation start rotate according to the conveyance state of Sheet S, the retard rollers 11, 12, and 13 rotate reversely, and since the pre division plate 32 is evacuated from on the conveyance path 31 at the time of retard separation operation which returns and conveys the low-ranking sheet S, the probability that \*\*\*\* will occur can be reduced.

[0061] Next, the 2nd operation gestalt of the sheet feeding device which starts this invention using drawing 3 and drawing 4 is explained. The important section enlarged view showing the composition of the 2nd operation gestalt of the sheet feeding device which drawing 3 requires for this invention, and drawing 4 are tropia explanatory drawings showing the composition of a move means to move a separation member in the 2nd operation gestalt. In addition, what was constituted like the aforementioned 1st operation gestalt attaches the same sign, and omits explanation.

[0062] the aforementioned 1st operation gestalt -- the alienation from the sheet S of pickup rollers 5, 6, and 7 -- although operation is interlocked with and the pre division plate 32 is made to always rock, the conveyance state of Sheet S is detected with the hand of cut of the retard rollers 11, 12, and 13, it is automatic and the pre division plate 32 is made to rock with this operation gestalt

[0063] The pre division plate 32 used as a separation member is supported to revolve by the rockable focusing on rotation shaft 32a like the aforementioned 1st operation gestalt, and is energized by the evacuation position shown with the dashed line of drawing 3 by the torsion coil spring 33.

[0064] Moreover, the cam 41 used as the move means moved to the protrusion position which contact engagement is carried out [ position ] at the side by which the pre division plate 32 is energized by the torsion coil spring 33 at the pre division plate 32, and makes this pre division plate 32 project on the conveyance path 31, and the evacuation position evacuated from on the conveyance path 31 is formed.

[0065] As shown in drawing 4 , axis-of-rotation 41a of a cam 41 is connected with the retard roller shafts 11a, 12a, and 13a through the torque limiter 42 and the gear train 43. And when the retard rollers 11, 12, and 13 carry out follower rotation to feed rollers 8, 9, and 10, it holds in the state where the pre division plate 32 was projected on the conveyance path 31 by the cam 41 as the solid line of drawing 3 showed.

[0066] In addition, it is constituted possible [ rotation by within the limits of the dashed line shown in drawing 3 by / to which the torque limiter 42 prepared in axis-of-rotation 41a as it rocked more than the protrusion position shown as the solid line of drawing 3 by / to which the pre division plate 32 does not illustrate / dashing and running against a member and a cam 41 was also shown in drawing 4 , and a stopper 44 do not illustrate / dashing and running against a member, and a solid line ].

[0067] When feeding with Sheet S, pickup rollers 5, 6, and 7 are in contact with the sheet S of the most significant currently loaded into the sheet feed deck 2 and the sheet cassettes 3 and 4 as the solid line of drawing 3 shows first.

[0068] And the first feed operation, Or when pickup rollers 5, 6, and 7 have sent out one sheet S to the nip section of feed rollers 8, 9, and 10 and the retard rollers 11, 12, and 13, the retard roller shafts 11a, 12a, and 13a carry out follower rotation to feed rollers 8, 9, and 10. The pre division plate 32 by which the cam 41 was supported by the rockable through the gear train 43 supported to revolve by the retard roller shafts 11a, 12a, and 13a is energized in the protrusion position shown as the solid line of drawing 3 .

[0069] And if the sheet S of two or more sheets is taken up in a bundle by pickup rollers 5, 6, and 7 from the sheet feed deck 2 or the sheet cassettes 3 and 4 when coefficient of friction between the sheets S currently loaded is large, or when the welding pressure of pickup rollers 5, 6, and 7 is large The nose of

cam is manipulated by this pre division plate 32 in contact with the pre division plate 32, and Sheet S is conveyed by the nip section of feed rollers 8, 9, and 10 and the retard rollers 11, 12, and 13 through conveyance path 31' which exceeded the upper-limit section of the pre division plate 32 above the conveyance path 31.

[0070] And if the nose of cam of Sheet S is pinched with feed rollers 8, 9, and 10 and the retard rollers 11, 12, and 13, a solenoid 36 operates and it is raised in the position which the pickup roller supporter material 34 shows with the dashed line of drawing 3 by the link 35, and pickup rollers 5, 6, and 7 will estrange from Sheet S, and will evacuate from a feed position.

[0071] And when it advances into the nip section of feed rollers 8, 9, and 10 and the retard rollers 11, 12, and 13 in a bundle, without the ability finishing selling S bundles of sheets by the pre division plate 32, the retard roller shafts 11a, 12a, and 13a are rotated reversely to feed rollers 8, 9, and 10. A cam 41 pushes down the pre division plate 32 on the evacuation position shown with the dashed line of drawing 3 through the gear train 43 supported to revolve by these retard roller shafts 11a, 12a, and 13a.

[0072] Thereby, since the pre division plate 32 has fallen rather than the original conveyance path 31, it does not become the hindrance at the time of the sheet S of the low rank which the retard rollers 11, 12, and 13 rotated reversely, and was taken two or more sheets returning, and being conveyed.

[0073] Moreover, two or more sheets S are conveyed in prior feed operation to the nip section of feed rollers 8, 9, and 10 and the retard rollers 11, 12, and 13. Though the pre division plate 32 is in an evacuation position, if one sheet S is conveyed by the aforementioned nip section in the next feed operation, the pre division plate 32 will project again and it will return to a position. If two or more sheets are conveyed by this nip section, the pre division plate 32 will not bar return conveyance of the taken sheet S by the inverse rotation of the retard rollers 11, 12, and 13 with an evacuation position.

[0074] Thus, always, with retard separation operation of the retard separation mechanism of the feed rollers 8, 9, and 10 of a sheet feeding device, and the retard rollers 11, 12, and 13, it projects, when the pre division plate 32 is required, and since it evacuates so that it may not become the hindrance when retard separation operation functions, the probability of occurrence of \*\*\*\* can be reduced.

[0075]

[Effect of the Invention] A separation member is operated, when separation operation by the separation member is required for it by supporting a separation member possible [ movement ] in the sheet feeding device of the retard separation method using conveyance body of revolution and separation body of revolution, since this invention has the composition and the operation like \*\*\*\*. By evacuating a separation member so that it may not become the hindrance at the time of retard separation operation, both separation operation and retard separation operation by the separation member can fully be operated, and the probability of occurrence of \*\*\*\* can be reduced.

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[Translation done.]

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## PRIOR ART

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[Description of the Prior Art] An example of the conventional sheet feeding device is explained using drawing 5 - drawing 7 . drawing 5 -- setting -- sheet feeding device 101 Sheet receipt equipment 102 with which the sheet S of two or more sheets was accumulated and contained on the sheet installation base which is not illustrated from -- pickup roller 103 which feeds with one sheet S of the most significant at a time this pickup roller 103 Sheet receipt equipment 102 from -- feed roller 104 which conveys the sheet S with which it was fed into the main part of image formation equipment (the direction of arrow a of drawing 5 ) this feed roller 104 Retard roller 105 countered and arranged the conveyance roller pair arranged at the near side of the main part of image formation equipment -- 106 It has.

[0003] Pickup roller 103 When the number of the sheets S with which it was fed is [ two or more ], it is the retard roller 105. Feed roller 104 It rotates to a hand of cut and an opposite direction (the direction of arrow b of drawing 5 ), the low-ranking sheet S is returned and conveyed, and the separation feed only of the one sheet of the most significant is carried out.

[0004] moreover, pickup roller 103 Feed roller 104 And sheet passage field 107 between the retard rollers 105 \*\*\*\* -- upper guide 108 it arranges -- having -- a feed roller 104 and retard roller 105 Conveyance roller pair 106 Between and conveyance roller pair 106 between the main parts of image formation equipment -- lower guide 109 It is arranged. And upper guide 108 Lower guide 109 It is guided and fed with Sheet S.

[0005] Feed roller 104 And retard roller 105 Drive transport unit 110 shown in drawing 6 It drives. drive transport unit 110 \*\*\*\* -- feed roller 104 Feed roller shaft 104a supported to revolve and retard roller 105 Retard roller driving shaft 105b connected with retard roller shaft 105a and this retard roller shaft 105a which are supported to revolve is arranged at abbreviation parallel.

[0006] Retard roller shaft 105a is the supporter material 111 which can be rocked focusing on rotation shaft 111a, as shown in drawing 5 . It is supported and can attach and detach in parallel to feed roller shaft 104a. Moreover, between retard roller shaft 105a and retard roller driving shaft 105b, it is distributor shaft coupling 112. And torque limiter 113 It is prepared.

[0007] The main driving means of the main part of image formation equipment which is not illustrated in the edge of feed roller shaft 104a to driving-input belt 114 Electromagnetic clutch 115 which transmits the driving force transmitted by minding to feed roller shaft 104a It is prepared.

[0008] Moreover, retard driving belt 116 which transmits the rotation driving force transmitted to feed roller shaft 104a between feed roller shaft 104a and retard roller driving shaft 105b to retard roller driving shaft 105b It is wound almost. In addition, distributor shaft coupling 112 Retard roller 105 Even if it displaces, it is for transmitting a drive to retard roller shaft 105a from retard roller driving shaft 105b.

[0009] The above-mentioned drive transport unit 110 Feed roller 104 to depend And retard roller 105 When a drive is explained, the rotation driving force first given from the main driving means of the main part of image formation equipment which is not illustrated is the driving-input belt 114. Electromagnetic clutch 115 by which is transmitted and ON/OFF control is carried out according to the feed timing of

Sheet S It is inputted into pulley 115a prepared in the amateur section.

[0010] Here, it is an electromagnetic clutch 115. The Rota section, feed roller shaft 104a which rotates in one, retard roller driving shaft 105b, and retard roller shaft 105a are the retard driving belt 116. Since it is connected, feed roller shaft 104a, retard roller shaft 105a, and retard roller driving shaft 105b rotate in this direction, and it is a feed roller 104. Retard roller 105 A rotation drive is carried out synchronizing with the time of the feed timing ON of Sheet S.

[0011] the above-mentioned drive transport unit 110 the time of one sheet S being sent at a time in the feed direction (drawing 5 and the direction of arrow a of drawing 6 ) -- retard roller 105 Feed roller 104 and the frictional force between Sheets S -- torque limiter 113 It races and rotates to the drive hand of cut and opposite direction of retard roller driving shaft 105b.

[0012] Moreover, when fed with the sheet S of two or more sheets, it is the retard roller 105. Torque limiter 113 since the frictional force between the sheets S of two or more sheets is small to the frictional force between Sheets S It is the retard roller 105, without racing. It rotates in the rotation driving direction and this direction of retard roller driving shaft 105b.

[0013] Feed roller 104 in the sheet S sent two or more sheets by this The low-ranking sheet S is separated from the sheet S of the most significant, and it a side, and \*\*\*\* of the sheet S into the main part of image formation equipment is prevented.

[0014] Next, sheet feeding device 101 of the above-mentioned composition The principle which satisfies the separation feed conditions of the sheet S to twist is explained. For feed conditions and \*\* formula, separation conditions and \*\* are [ the following \*\* formulas ] the retard roller 105. The relational expression with which it is satisfied of the circumference conditions of a companion, respectively is shown.

[0015] In addition, in following \*\*, \*\*, and \*\* formula, muAP is coefficient of friction between the sheets S of the nip section with a pickup roller 103. Coefficient of friction between Sheets S and muBP are a feed roller 104. Coefficient of friction between Sheets S and muCP are the retard roller 105.

Coefficient of friction between Sheets S, and muAPP Pickup roller 103 Coefficient of friction between a pressurization subordinate's sheets S, and muBPP Feed roller 104 Retard roller 105

[0016] Moreover, N is the retard roller 105. It is welding pressure and T is a torque limiter 113. It is idling torque and  $r$  is the retard roller 105. It is a radius and W is a pickup roller 103. It is welding pressure.

[0017]

[Equation 1]

[0018]

[Equation 2]

[0019]

[Equation 3]

[0020] In addition, if the same sheet S is used in each above-mentioned formula and it will replace with  $\mu_{APP} \cdot \mu_{BPP} = \mu_{PP}$  since coefficient of friction of each roller pressurization section does not vary so greatly, the aforementioned  $\mu_{APP}$  and  $\mu_{BPP}$  formula will turn into  $\mu_{PP}$  of the following, and  $\mu_{PP}$  formula, respectively.

[0021]

[0022]

[Equation 5]

[0023] It is the retard roller 105 about the relation of the above-mentioned \*\*, \*\*, and \*\* formula. Welding pressure N and torque limiter 113 What made idling torque T the parameter and graph-ized it is shown in drawing 7 . In this drawing, a slash section field is the proper feed field A of Sheet S. That is, in order to expand the proper feed field A, coefficient of friction between each roller and Sheet S is enlarged, or it is a pickup roller 103. It is necessary to make welding pressure small.

[0024] Moreover, retard roller 105 Welding pressure N and torque limiter 113 The proper feed field A becomes [ the direction which set the feed conditions of Sheet S to the bottom of the condition of the direction (the direction of the upper right of drawing 7 ) which both enlarges idling torque  $T$  ] large.

[0025] However, torque limiter 113 If idling torque  $T$  is enlarged recklessly, since the load torque in a roller drive will increase, a certain amount of [ the upper limit (limitation at the upper right of drawing 7 ) of the proper feed field A ] restrictions will be received.

[0026] Sheet feeding device 101 which supplies Sheet S to the image formation section with improvement in the speed of the main part of image formation equipment in recent years. Improvement in the speed has been required. And as it becomes high-speed with a natural thing, it becomes more difficult to secure the reliability of the feed performance of Sheet S.

[0027] It is especially sheet receipt equipment 102. Since the pick up time of the sheet S of a shell becomes short, it is a pickup roller 103. It is necessary to set up the conveyance force more greatly. However, when it does so, there is a problem of becoming easy to generate \*\*\* shortly.

[0028] The reason is a pickup roller 103. In order to raise the conveyance force, it is a pickup roller 103. Coefficient of friction with Sheet S is made big, or it is a pickup roller 103. Although welding pressure must be enlarged, it is a pickup roller 103. By changing the quality of the material, it is difficult to change coefficient of friction a lot, and the means which surely enlarges welding pressure is used in many cases.

[0029] However, pickup roller 103 It becomes difficult to accept one sheet S of the most significant and to take it up, since the frictional force between the sheet S of the most significant of sheet receipt equipment 102 and the sheet S under it will also become large if welding pressure becomes large, the sheet S of the most significant takes the sheet S under it with it, and is conveyed, and it is a feed roller 104. Retard roller 105 Sheet S becomes two or more sheet bunch, and is conveyed by the nip section.

[0030] The bunch of this sheet S is the retard roller 105. Although an inversion will separate into one sheet at a time, if too much many sheets S advance in a bundle simultaneously, the limitation of the separative power is exceeded and \*\*\*\*\*(ed). Especially a variety of sheets [ recently ] S exist, and what has very larger coefficient of friction between Sheets S than usual exists depending on the kind of sheet S.

[0031] therefore, the conventional sheet feeding device 101 \*\*\*\* -- it is shown in drawing 5 -- as -- sheet receipt equipment 102 The sheet feed direction downstream It is a feed roller 104 at (it is only hereafter called a "downstream"). Retard roller 105 Rather than the nip section, the sheet feed direction upstream It is arranged (it is only hereafter called an "upstream"), and is a pickup roller 103. Conveyance path 117 of the sheet S with which it is fed Pre division plate 118 which is projected upwards and separates Sheet S in contact with Sheet S It has prepared.

[0032] pre division plate 118 Pickup roller 103 the time of being fed with the sheet S of two or more sheets -- original feed roller 104 Retard roller 105 from -- pre division plate 118 which mentioned above

the nose of cam of S bundles of sheets in the near side of the becoming retard separation mechanism It is made to some extent easy to be making it contact, and shifted and dealing with a nose-of-cam position, and to separate.

[0033] However, this pre division plate 118 Conveyance path 117 If the contact angle to the amount of protrusions or Sheet S is enlarged Pickup roller 103 Since there is a possibility that it may become impossible to feed, it is a feed roller 104. Retard roller 105 An effect to the extent that penetration of S bundles of sheets to the nip section is prevented completely is not expectable. to the last -- original feed roller 104 Retard roller 105 from -- although the becoming retard separation mechanism is auxiliary, except the sheet S with extremely bad separability, sufficient effect is acquired by combining with this retard separation mechanism

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[Translation done.]

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## DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] It is cross-section explanatory drawing showing the composition of image formation equipment equipped with the sheet feeding device concerning this invention.

[Drawing 2] It is the important section enlarged view showing the composition of the 1st operation gestalt of the sheet feeding device concerning this invention.

[Drawing 3] It is the important section enlarged view showing the composition of the 2nd operation gestalt of the sheet feeding device concerning this invention.

[Drawing 4] It is tropia explanatory drawing showing the composition of a move means to move a separation member in the 2nd operation gestalt.

[Drawing 5] It is drawing explaining the conventional example.

[Drawing 6] It is drawing explaining the conventional example.

[Drawing 7] It is drawing explaining the conventional example.

[Description of Notations]

1 [ -- Sheet cassette, ] -- The main part of image formation equipment, 2 -- 3 The sheet feed deck, 4 5, 6, 7 -- A pickup roller, 8, 9, 10 -- Feed roller, 8a, 9a, 10a -- A feed roller shaft, 11, 12, 13 -- Retard roller, 11a, 12a, 13a -- A retard roller shaft, 14 -- Resist roller pair, 15 [ -- A developing machine, 18 / -- Imprint electrification machine, ] -- A picture reader, 16 -- A photo conductor drum, 17 19 [ -- An inside eccrisis roller pair 22 / -- Eccrisis tray, ] -- A conveyance belt, 20 -- A fixing assembly, 21 23 [ -- Re-feed path, ] -- An inside eccrisis roller pair, 24 -- A switch back roller pair, 25 26 [ -- 29 A re-feeding device, 30 / -- Conveyance roller pair, ] -- A double-sided conveyance path, 27 -- A middle tray, 28 31 [ -- A rotation shaft, 33 / -- Torsion coil spring, ] -- A conveyance path, 32 -- A pre division plate, 32a 34 [ -- A rotation shaft, 36 / -- A solenoid, 41 / -- A cam, 41a / -- The axis of rotation, 42 / -- A torque limiter, 43 / -- A gear train, 44 / -- A stopper, S / -- Sheet ] -- Pickup roller supporter material, 35 -- A link, 35a

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[Translation done.]

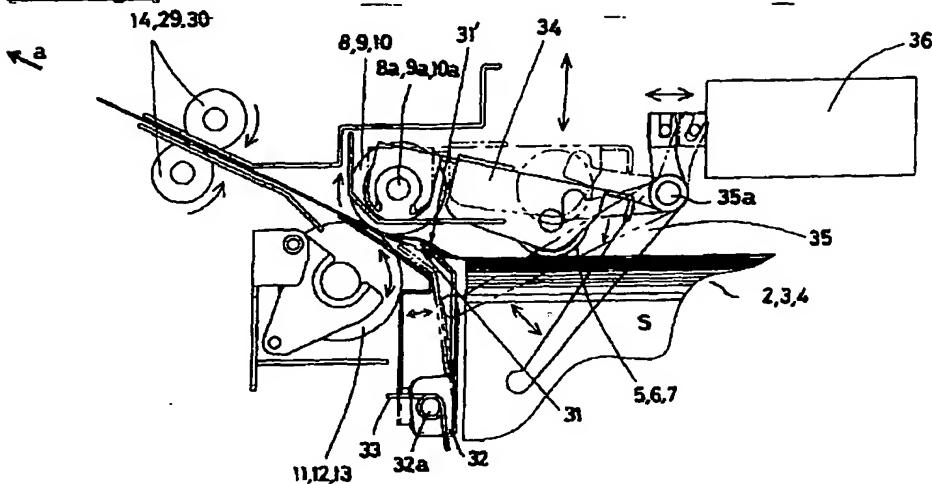
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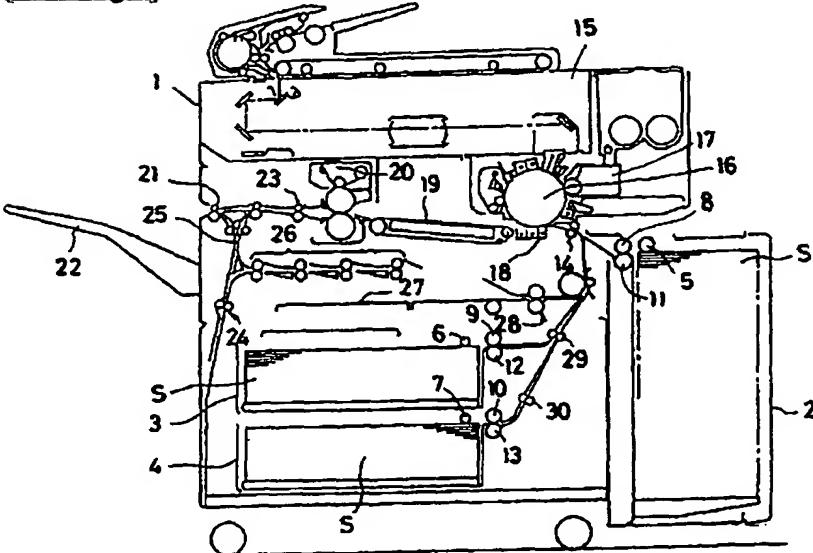
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## DRAWINGS

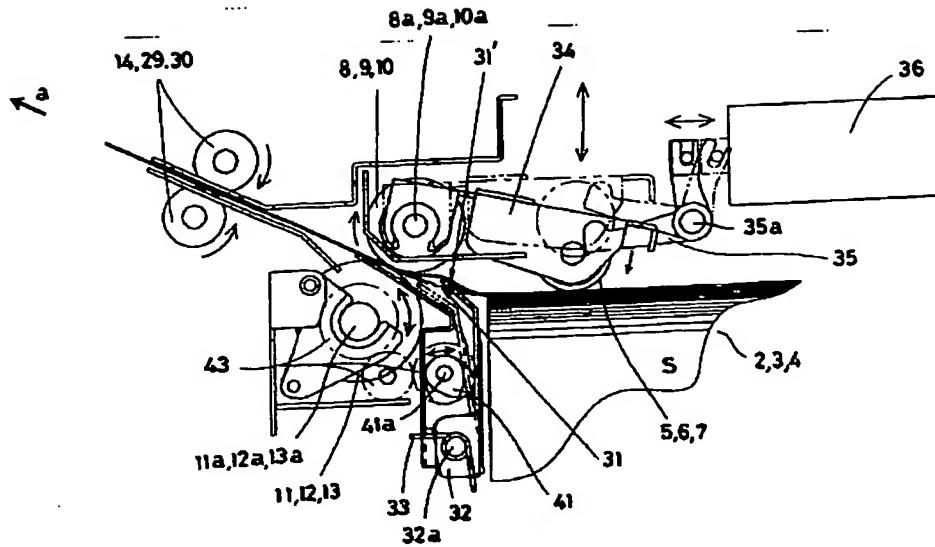
## [Drawing 2]



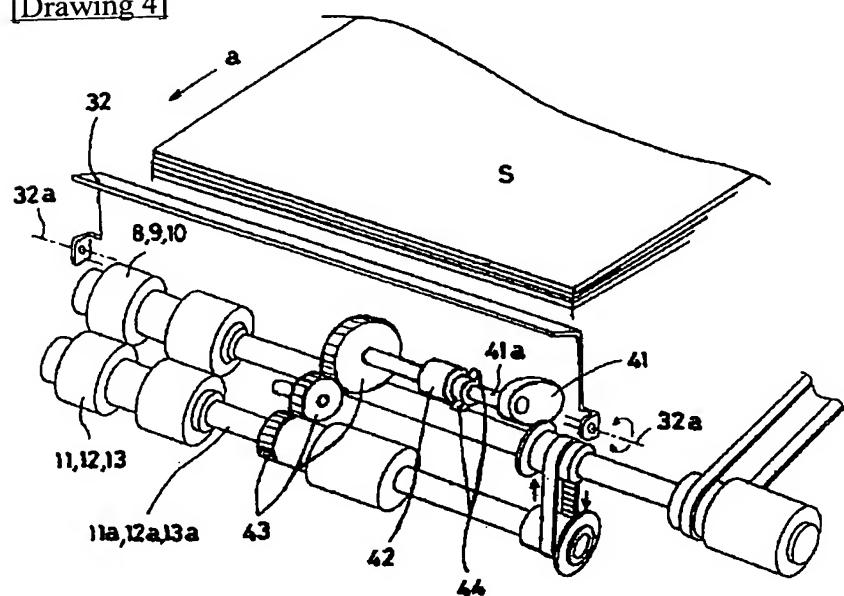
## [Drawing 1]



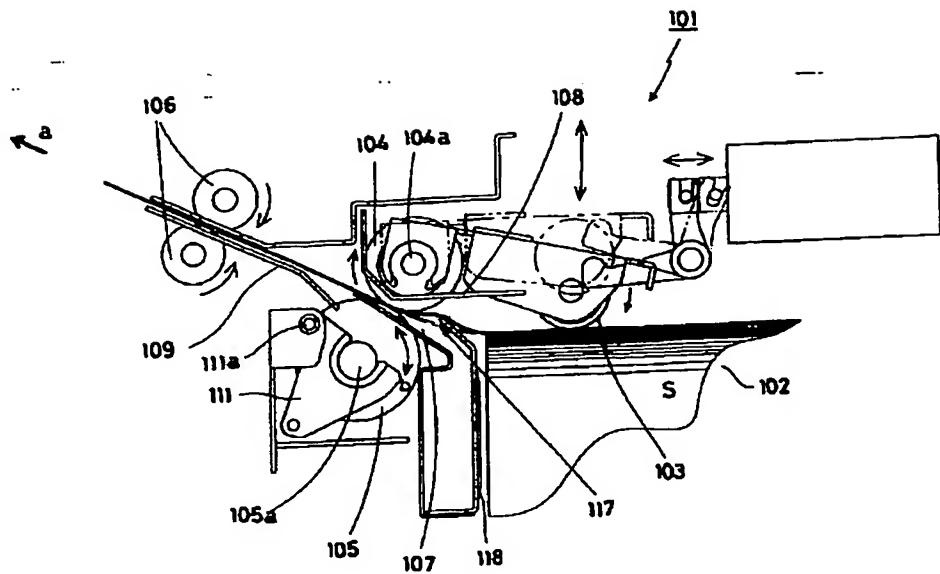
## [Drawing 3]



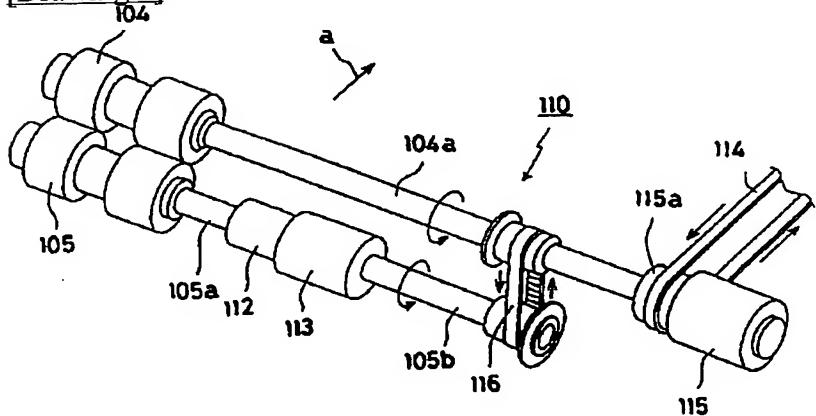
[Drawing 4]



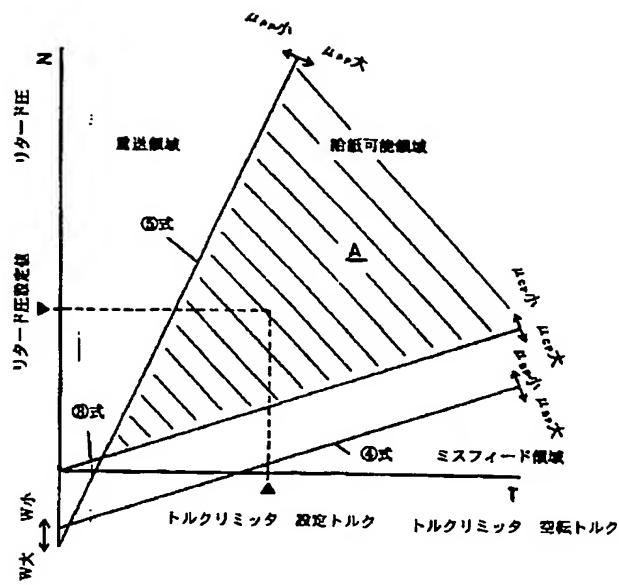
[Drawing 5]



[Drawing 6]



[Drawing 7]



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